Algebra 2 Modeling Quadratic Functions

**Answer all questions on a separate sheet of paper.**

1. The height **h(t)**, in feet above the ground, of a ball thrown into the air from the top of a building is given by the function **h(t) = -16(t - 2)2 + 264**, where t is the number of seconds the ball has been in the air.

1. MC900155561[1]sketch a graph of the function h(t) for 0 < t < 10.
2. From what height was the ball thrown?
3. What is the maximum height the ball will reach?
4. When does the ball strike the ground?
5. For what values of t does the function have meaning?

2. Architecture. A bridge over a river is supported by parabolic arches allowing water to flow through. The span of one arch is 20 feet and the height of the arch at its center is 10 feet.

MC900057644[1]

1. Sketch a diagram to model this information.
2. Choose suitable rectangular coordinate axes and

find the particular equation of the parabola.

c. What is the height of the arch 2 feet from the

base of the arch?

MC900140541[1]3. Standley Lake’s quarterback is standing on the 40-yard line. He throws a pass toward the goal line. The ball is 2 meters above the ground when he lets it go. It follows a parabolic path and reaches its highest point, 14 meters above the ground, as it crosses the 20-yard line. Let x be the number of yards from the goal line and let y be the number of meters above the ground. Set up a picture using the coordinate system.

1. Write the equation of the parabola.
2. Would it be possible for someone to catch the pass as it crosses the 10-yard line? How high would it be?
3. If nobody catches the ball or deflects it, approximately where will it hit the ground?
4. Sketch a graph with an appropriate domain.

MC900440239[1]MC900440464[1]

4. Suspension Bridge: A suspension bridge with weight uniformly distributed along its length has twin towers that extend 75 meters above the road surface and are 400 meters apart. The cables are parabolic in shape and are suspended from the tops of the towers. The cables touch the road surface at the center of the bridge.

1. Sketch a diagram to model this information. Then, using a suitable coordinate system, find the equation of the parabola that models this situation.
2. Find the height of the cables at a point 100 meters from the center of the bridge.

MC900031046[1]

5. The Golden Gate Bridge. The Golden Gate Bridge, a suspension bridge, spans the entrance to San Francisco Bay. Its 746 foot-tall towers are 4200 feet apart. The bridge is suspended from two huge cables more than 3 feet in diameter; the 90 foot-wide roadway is 220 feet above the water. The cables are parabolic in shape and touch the road surface at the center of the bridge.

1. Sketch a diagram to model this information. Then, using a suitable coordinate system, find the equation of the parabola that models this situation.
2. Find the height of the cable at a distance of 1000 feet from the center of the bridge.

**Extra Credit:**

Gateway Arch Problem:

MCTR00586_0000[1]On a trip to St. Louis you visit the Gateway Arch. Since you have plenty of time on your hands, you decide to estimate its altitude. You set up a Cartesian coordinate system with one end of the arch at the origin. The other end of the arch is at x = 162 meters. To find a third point on the arch, you measure a value of y= 4.55 meters when x = 1 meter. You assume that the arch is parabolic.

1. What is the x-coordinate of the vertex?
2. To find the **a** and **k**, you must set up a system of equations and solve

by elimination or substitution.

1. What is the particular equation of the arch?
2. An airplane with a wingspan of 40 meters tries to fly through the arch at an altitude of 170 meters. Could the plane possibly make it? Justify your answer.